

THE CRUSHED STONE JOURNAL

Official Publication
The National Crushed Stone Association

In This Issue—

**Cape Girardeau Plant, Marquette
Cement Mfg. Co., Wins 1929
N.C.S.A. Safety Competition**

**How Perfect Records in Accident
Prevention Are Accomplished**

We Invite You to St. Louis

**Methods Required to Produce Endur-
ing Smoothness in Bituminous
Macadam Surfaces**

SEPTEMBER, 1930

WHY HAVE LOSSES

Poor Grading—High Overhead—Troubles

Ask the following stone producers why they are using **NIAGARA**
ROLLER BEARING SCREENS year after year

Solvay Process Company	Jamesville, N. Y.	Blue Stone Quarry Company	Gwynedd Valley, Pa.
Solvay Process Company	Syracuse, N. Y.	Whiterock Quarries	Pelasant Gap, Pa.
Rock-Cut Stone Company	Auburn, N. Y.	Connecticut Quarries Company	Rocky Hill, Conn.
Rock-Cut Stone Company	Ballina, Mallison Co., N. Y.	New Haven Trap Rock Company	New Haven, Conn.
Rock-Cut Stone Company	Jamesville, N. Y.	Edward Balf Company	Hartford, Conn.
Rock-Cut Stone Company	Lacona, N. Y.	John S. Lant and Son	Westfield, Mass.
Rock-Cut Stone Company	Watertown, N. Y.	West Roxbury Trap Rock Company	West Roxbury, Mass.
Mohawk Limestone Products Company	Mohawk, N. Y.	Old Colony Crushed Stone Company	Quincy, Mass.
Mohawk Limestone Products Company	Jordanville, N. Y.	Rowe Contracting Company	Malden, Mass.
Mohawk Limestone Products Company	Mount Vision, N. Y.	Simbrico Stone Company	West Roxbury, Mass.
BUFFALO Crushed Stone Company	Buffalo, N. Y.	Casper Stolle Quarry & Construction Co.	East St. Louis, Ill.
Federal Crushed Stone Company	Cheektowaga, N. Y.	Consumers Company	Lemont, Ill.
Genesee Stone Products Company	Stafford, N. Y.	Federal Stone Company	LaGrange, Ill.
LeRoy Lime and Crushed Stone Company	LeRoy, N. Y.	Michigan Limestone & Chemical Company	Rogers City, Michigan
Ribstone Concrete Products	LeRoy, N. Y.	Biesans Stone Company	Winona, Minn.
Dolemite Products Company	Rochester, N. Y.	Messberger Bros. Stone Company	Berne, Ind.
General Crushed Stone Company	Oaks Corners, N. Y.	Hy-Rock Products Company	Marengo, Ind.
General Crushed Stone Company	North LeRoy, N. Y.	Fanwood Stone Crushing & Quarry Co.	Fanwood, N. J.
General Crushed Stone Company	Glenmills, Penna.	Samuel Braen	Patterson, N. J.
Wagner Quarries	Sandusky, Ohio	Orange Quarry Company	West Orange, N. J.
Wagner Quarries	Castalia, Ohio	Granite Rock Company	Logan, Calif.
Dolemite, Inc.	Maple Grove, Ohio	Daniel Contracting Company	San Francisco, Calif.
Hersog and Sons	Firest, Ohio	Deitz Hill Development Company	Kansas City, Mo.
Ohio Blue Limestone	Marion, Ohio	Rock Hill Quarries Company	St. Louis, Mo.
National Lime & Stone Co.	Spore, Ohio	Texas Trap Rock Company	San Antonio, Texas
National Lime & Stone Co.	Carey, Ohio	Dittlinger Lime Company	New Braunfels, Texas
National Lime & Stone Co.	Lewisburg, Ohio	James Stone Company	Corsicana, Texas
National Lime & Stone Co.	Bluffton, Ohio	Franklin Limestone Company	Nashville, Tenn.
Belle Center Stone Co.	Belle Center, Ohio	Gager Lime Company	Sherwood, Tenn.
Higgins Stone Company	Bellevue, Ohio	John H. Wilson	Honolulu, Hawaii
Lake Erie Limestone Company	Youngstown, Ohio		
Lake Erie Limestone Company	Lowellville, Ohio		
Lake Erie Limestone Company	Hillsville, Pa.		
Lima Stone Company	Lima, Ohio		
Spencer Stone Company	Spencerville, Ohio		
Union Limestone Company	Youngstown, Ohio		
Ohio Marble Company	Piqua, Ohio		
C. C. Beam	Mevin, Ohio		
Rock Products Company	Toledo, Ohio		
France Stone Company	Holland, Ohio		
France Stone Company	Monroe, Mich.		
Swint Stone Company	Fremont, Ohio		
J. E. Baker Company	Bainbridge, Lancaster Co., P.		
J. E. Baker Company	White Hall, Baltimore, Md.		
New Castle Lime & Stone Company	New Castle, Pa.		
New Castle Lime & Stone Company	Dunbar, Pa.		
Lehigh Stone Company	Ormsrod, Pa.		
Stowe Trap Rock Company	Pottstown, Pa.		
Carbon Limestone Company	Hillsville, Pa.		

CANADA

J. A. Bourbonnais	Vaudrell, Que.
Canada Crushed Stone Corp.	Puslinch, Ont.
Coast Quarries	Vancouver, B. C.
Dufferin Construction Company	Innerkip, Ont.
Gordon Crushed Stone Company	Hagerville, Ont.
Thomas Langton Crushed Stone	Collwater, Ont.
LaCie A. Desrochers, Ltd.	Montreal, Que.
Puslinch Quarries, Ltd.	Puslinch, Ont.
Quinn Stone and Ore Company	Ft. William, Ont.
Rigand Granite Products Company	Rigand, Que.
Stone and Son	Ingersoll, Ont.
Standard Lime Company, Ltd.	Joliette, Que.
Walker Bros.	Thorold, Ont.
Warden King Company, Ltd.	Montreal, Que.

LET US FIGURE YOUR PROBLEMS

NIAGARA CONCRETE MIXER CO.

40 PEARL STREET
BUFFALO, N. Y.

When writing advertisers please mention THE CRUSHED STONE JOURNAL





FOR BLASTS LIKE THIS---- USE HERCULES EXPLOSIVES

The photograph above is of a successful blast in a large Pennsylvania limestone quarry where Hercules explosives brought down 60,000 tons of rock.

The explosives for this blast were carefully selected to give the best results in this particular quarry, yet the same charge might not have been so satisfactory in another quarry. But—there isn't a quarry, regardless of size or the problems involved, where properly selected Hercules explosives won't meet the blasting needs effectively and economically.

It pays to use correct explosives. To help make selection easier, we have printed at the right the comprehensive list of Hercules explosives which are designed to meet your every blasting requirement. Hercules service men are always glad to advise in connection with proper selection and use of these explosives. Check the coupon-list for further information.

HERCULES POWDER COMPANY

INCORPORATED

Wilmington Delaware

ALLENTOWN, PA.
BIRMINGHAM
BUFFALO
CHICAGO
DENVER
DULUTH

HAZLETON, PA.
HUNTINGTON, W. VA.
JOPLIN, MO.
LOS ANGELES
NEW YORK CITY
NORRISTOWN, PA.
PITTSBURG, KAN.
PITTSBURGH, PA.

POTTSVILLE, PA.
ST. LOUIS
SALT LAKE CITY
SAN FRANCISCO
WILKES-BARRE
WILMINGTON, DEL.



THE EXPLOSIVE FOR YOUR WORK IS IN THIS LIST

☐ **HERCULES GELATIN EXTRA L. F.**—Dense and strong • plastic and water-resisting • first in fumes • the leading gelatin-type, all-purpose explosive • strengths: 30% to 90% • 190 cartridges.*

☐ **HERCULES GELATIN L. F.**—Dense and strong • plastic and water-resisting • needed only under severest conditions • first in fumes • strengths: 20% to 90% • 184 cartridges.*

☐ **GELAMITES 1 and 2**—Semi-plastic • water-resisting • bulkier than the gelatins • often replace gelatins up to, and including 60% strength at a saving in cost • No. 1—220, and No. 2—240 cartridges.*

☐ **HERCULES STRAIGHT NITROGLYCERIN L. F.**—Strong • fast • water-resisting in higher strengths • strengths: 15% to 60% • 208 cartridges.*

☐ **HERCULES EXTRA L. F.**—For general blasting • strengths: 20% to 60% • 220 cartridges.*

☐ **HERCOMITES 2 to 7**—General purpose explosives • very economical where suitable • 240 cartridges* for No. 2, to 350 for No. 7 • also Hercomite Bag packed in 12½ lb. bags.

☐ **HERCULES TORPEDO GELATIN**—Replaces liquid nitroglycerin for shooting oil, gas, and water wells • strength: 80% • 196 cartridges.*

☐ **HERCULES BLASTING GELATIN**—Water-resisting and powerful • valuable for submarine blasting, shooting gas or oil wells • 100% strength • 200 cartridges.*

☐ **HERCULES CONTRACTORS' DYNAMITE**—Low-strength explosives with strong heaving action • strengths: 5%, 10%, 15%, 20% • 5% packed in 12½ lb. bags only, others 2½" cartridges.

☐ **HERCULES BLASTING POWDERS**—"A": 8 granulations (coarse to fine) and dust—"B": 7 granulations and Herco—used in well-drill holes with Cordeau-Bickford detonating fuse—all powders packed in 25 lb. kegs.

☐ **HERCULES BLASTING SUPPLIES**—A complete series of detonators and blasting accessories.

*NOTE: Cartridge counts refer to the approximate number of 1¼" by 8" cartridges in 100 lbs. of the explosive.

HERCULES POWDER COMPANY
973 King Street, Wilmington, Delaware
Gentlemen: Please send me pamphlets describing the explosives checked.

Name.....

Company.....

Street.....

P. O.....

D-1

Another Use of LINN to Save TIME and MONEY in the QUARRY



Twenty tons of solid marble is the normal pay load of Linn Tractors and Trailers used by The Vermont Marble Co.



PUTTING MORE PROFIT INTO MARBLE...

Only LINN Offers You All These Advantages:

- 1** Patented Flexible Traction that grips any surface under all weather conditions.
- 2** Tremendous hauling power—100 horsepower to take full advantage of LINN Traction.
- 3** Ten ton capacity on its own chassis.
- 4** Extra traction and power for additional tow loads.
- 5** Easy on men—steers like a truck.
- 6** Four speeds forward—with four speed reverse optional.

Hauling twenty tons at a clip—up grade—over rough surface—through mud—that is the job LINN Tractors and Trailers are doing for the Vermont Marble Company.

The sturdy LINN does it easily—does it dependably—does it economically irrespective of weather. It's the ideal hauling unit for quarry operations. No time lost moving fixed tracks. These LINNS lay their own road, carrying ten tons on super strength chassis, beside hauling ten tons on trailers.

LINN'S exclusive design—coordinating giant power with full ground contact, non-clogging, non-slipping flexible traction makes such performance possible.

Write for data showing how LINN makes more profits in quarry and other industrial operations by saving hauling and supplementary labor costs.

LINN MANUFACTURING CORPORATION

Division of LAFRANCE-REPUBLIC Corporation

Manufacturers of American La France Trucks, Linn Tractors, Republic Trucks

Factories: Alma, Mich. Morris, New York

Represented in:

Patent No. 1,370,531
Patent No. 1,521,454
Patent No. 1,685,641
Patent No. 1,855,876
Patent No. 1,701,979
Other Patents Pending



105 direct distributors located throughout the United States and 49 distributors located in 30 foreign countries

Canadian Linn Distributors: Mussels Limited, Montreal

When writing advertisers please mention THE CRUSHED STONE JOURNAL

The CRUSHED STONE JOURNAL

Published by The National Crushed Stone Association

Merchandise Building, 14th and S Sts., Washington, D. C.

Vol. VI No. 9

WASHINGTON, D. C.

September, 1930

Cape Girardeau Plant, Marquette Cement Mfg. Co., Wins 1929 N.C.S.A. Safety Competition

Five Other Quarries Earn Distinction by Completing Year With No Lost-time Accidents

FOR the second successive year, the Cape Girardeau limestone quarry of the Marquette Cement Manufacturing Company located at Cape Girardeau, Missouri, enjoys the distinction of winning the National Crushed Stone Association Safety Contest and with it the *Explosives Engineer* award. It will be remembered that this award is presented annually to the member of the National Crushed Stone Association making the best record in the National Safety Competition. The Cape Girardeau plant first won the trophy in 1928 and repeated their excellent performance of that year in the competition for 1929, the results of which were recently announced by W. W. Adams of the United States Bureau of Mines, who acts as judge for the contest. During 1929 five plants operated by member companies of the Association entered in the National Safety Competition completed the year with no lost-

time accidents. When more than one plant completes the year with a perfect record, the Bureau of Mines in accordance with the rules of the contest, rates the plants with perfect records according to their respective total man-hours of exposure, the one having the highest number of man-hours of exposure winning the contest, and each of the others receiving honorable mention.

The Cape Girardeau limestone quarry of the Marquette Cement Mfg. Co. was therefore designated the winner for 1929 with a total exposure of 197,327 man-hours.

Four Plants Receive Honorable Mention

First honorable mention was accorded the Rock Hill trap rock quarry of the General Crushed Stone Co., located near Quakertown, Pa., which had a total ex-



Quarry Employees, Cape Girardeau Plant, making perfect Safety Record in 1929

posure of 194,233 man-hours. The General Crushed Stone Co. was particularly fortunate in having two of its quarries complete the year with no lost-time accidents, third honorable mention being awarded its



W. F. Wise (right) President, National Crushed Stone Association, presenting *Explosives Engineer Award* to E. M. Gould, Quarry Supt., Cape Girardeau Plant, Marquette Cement Mfg. Co.

Oaks Corners limestone quarry located at Geneva, New York, which had a total exposure of 115,918 man-hours. In passing it should be noted that the White Haven plant of the General Crushed Stone Co., located at White Haven, Pa., won the contest for 1927 with a total exposure of 159,320 man-hours.

To the Birdsboro trap rock quarry of the John T. Dyer Quarry Co., located at Birdsboro, Pa., goes the distinction of winning second honorable mention with a total exposure of 166,876 man-hours. This company has also produced two winners, as this same plant received first honorable mention in the 1928 contest with a total exposure of 166,768 man-hours.

To the Speed limestone quarry of the Louisville Cement Co., located at Speed, Indiana, goes third honorable mention with a total exposure of 124,423 man-hours. The Speed quarry of the Louisville Cement Co. enjoys the unusual distinction of having been among

the winners each year since the contest started in 1926, having won the contest in that year, received first honorable mention in 1927, second honorable mention in 1928, and third honorable mention in 1929. We also understand that at the beginning of our contest in 1926 the Speed quarry of the Louisville Cement Co. had operated in excess of a year with no lost-time accidents, making their record at the close of the 1929 contest in excess of five years. Suitable recognition will be made of the remarkable record established by this quarry when a special award will be presented to them by the Association at its forthcoming annual convention, for having established a no-accident record for a period in excess of five years.

The North Baltimore limestone quarry of the France Stone Co., located at North Baltimore, Ohio, was awarded fifth honorable mention with a total exposure of 70,515 man-hours. The France Stone Co. has also earned meritorious distinction since the contest started in 1926, its Monroe quarry receiving first honorable mention in 1926, its Bloomville Quarry third honorable mention in 1928 and its North Baltimore quarry fifth honorable mention in 1929.

Presentation Ceremony Held at Cape Girardeau

The winner of the contest is presented with the *Explosives Engineer* award, a bronze plaque on which is portrayed in bas-relief the quarry scene on the pedestal of the Sentinels of Safety trophy which is the award for the National Safety Competition. To each plant receiving honorable mention there is presented a parchment reproduction of the *Explosives Engineer* award, and to each employee of all of the plants which complete the year with no lost-time accidents the National Crushed Stone Association presents a certificate of honor.

The presentation was made at the Cape Girardeau plant of the Marquette Cement Mfg. Co., at Cape Girardeau, Mo., on June 30. The exercises were held at 7:30 in the evening, from a platform which had been specifically constructed for that purpose in an open space immediately in front of the company's offices and most appropriately surrounded by the plant itself.

The executives of the Cape Girardeau plant are particularly deserving of praise for the exceptionally interesting program which was arranged and it must have been pleasing to them to witness the remarkable turn-out of the plant's employees and their families who numbered well over five hundred.

H. O. Cole, Plant Manager, presided at the meeting and introduced the various speakers. The celebration was opened by the playing of "America" by the American Legion Clown Band of Cape Girardeau. This was followed immediately by the invocation given by the Rev. E. V. Owens of the First Baptist Church. The address of welcome was made by R. C. Matthews, Plant Superintendent, which was followed by M. P. Greer, Safety Engineer of the Marquette Cement Mfg. Co., who rededicated the eight-ton safety trophy won by the Cape Girardeau plant the previous year in the safety contest conducted by the Portland Cement Association.

W. F. Wise, President of the National Crushed Stone Association, then presented the *Explosives Engineer* award to the Cape Girardeau plant for having won the National Crushed Stone Association safety contest for 1929. E. M. Gould, Quarry Superintendent, accepted the trophy on behalf of the plant. Following the presentation of the bronze plaque, President Wise presented the parchment reproductions of the plaque to those companies receiving honorable mention, Harry

Schwartz of the John T. Dyer Quarry Co. being the only representative present to receive the award.

N. S. Greensfelder, Director of the *Explosives Engineer* magazine, who was scheduled to appear on the program found it impossible to be present. We are indebted to Mr. Greensfelder, however, for designating Mr. John P. Walsh to act in his place.

Remarks were then heard from J. Grant Frye, Prosecuting Attorney of Cape Girardeau County; from D. J. Hanley, Assistant to the Secretary, Marquette Cement Mfg. Co.; and from J. J. Kelly, Manager of Industrial Relations, Marquette Cement Mfg. Co.

The concluding number of the program was the presentation to each employee of the Cape Girardeau plant of the certificates of honor given by the National Crushed Stone Association. J. R. Boyd, Secretary, presented these certificates on behalf of the Association. Throughout the program at appropriate intervals musical numbers were rendered by the band. At the conclusion of the formal program moving pictures on accident prevention were shown.



1929 Foremen's and Workmen's Safety Committee, Cape Girardeau Plant, Marquette Cement Manufacturing Co.

How Perfect Records in Accident Prevention are Accomplished

As Related by Some of the Winners in the 1929 Contest

SHORTLY after the United States Bureau of Mines announced the winners of the National Crushed Stone Association Safety Contest for 1929, it occurred to us that it would be most interesting information for those of our members interested in accident prevention (and this should include the entire membership) if those plants which had made perfect safety records would briefly describe the procedure followed in their accident prevention work. We therefore corresponded with the various winners in the contest asking if they would submit for publication in the *Journal* a brief digest of the methods pursued. The following companies whose comments are given responded to our request and we are deeply indebted to them for their helpful cooperation in thus assisting in the accident prevention movement.

Accident Prevention Work of the General Crushed Stone Company

In the contest for 1929 the General Crushed Stone Company had two plants entered which made perfect records. The following briefly describes their accident prevention procedure:

"The Rock Hill quarry of the General Crushed Stone Company is situated in Bucks County, Pennsylvania,

near Quakertown, and is in charge of Mr. E. E. Dotter. It is a trap rock quarry and has a daily capacity of about 1,200 tons. Up to this year it was a hand-loading quarry and during 1929 operated more than 194,000 man-hours without experiencing a lost-time accident, and on August 1st, 1930, this clear record has been maintained. The hand-loading feature naturally adds considerably to the hazardous nature of the operation. During the operating season of 1929 the force amounted to about one hundred men.

"The Geneva quarry is located at Oaks Corners, about seven miles from Geneva, New York, and the plant has a daily capacity of about 2,000 tons. The deposit is limestone and during 1929 the plant operated almost 116,000 man-hours and lost no time due to injuries. The organization consists during the operating season of about fifty men and is in charge of Mr. Linford M. Croll.

"There is organized at each of our quarries a safety committee composed of from five to seven men representative of the various departments of the quarry and plant. The committee at Rock Hill consists of Roy Craghead, quarry foreman, who is also chairman of the safety committee; Thomas Foltz, plant foreman; E. K. Barndt, carpenter; Dan Dieose, oiler; John Angney, crusher foreman; Clyde I. Feist, timekeeper; E. E. Dotter, superintendent. The timekeeper at each plant acts as secretary of the safety committee. The committee at Geneva is composed of Charles P. Wise, powderman, who is chairman of the committee; Allen R. Nash, quarry foreman; Ernest Eddings, oiler; Alpheus Carter, dinky operator; William Newhall, electrician; Leslie Champion, timekeeper; Linford M. Croll, superintendent.

"Each plant safety committee meets once a month, which meetings are attended by the representative of the company in charge of accident prevention at all the quarries, H. F. Yotter. At these meetings the suggestions and recommendations previously approved are reviewed to ascertain whether they have been carried out.



Quarry Employees, Geneva Plant, General Crushed Stone Co.



Safety Committee, Geneva Plant, General Crushed Stone Co.

"Each week a complete inspection of the quarry and plant is made by one or two members of the safety committee and, to assist them in checking certain hazardous conditions, we have adopted a form containing some thirty questions covering mechanical guards, safe practices, and general safety conditions. The reports of this kind covering inspections made since the last meeting are discussed and any new recommendations made are approved or rejected.

"There is sent out monthly to each plant by the home office a letter listing the accidents occurring at all the operations during the previous month, the record of time worked and days lost through injuries at each quarry for that month and for the year to that time. This acquaints each plant with its record and gives a comparative standing of each operation. This letter is read and thoroughly discussed at the monthly meeting.

"The members of the committee are then requested to present suggestions with reference to accident prevention, which are likewise reviewed and passed upon.

"These meetings serve to maintain and stimulate interest in accident prevention, and by the members of the committees passing along to the workmen the ideas presented at the meetings we aim to interest in the movement each man in the organization, which is essential if accidents are to be reduced to a minimum.

"We have erected at each of our operations, in a conspicuous location, an attractive bulletin board for the display of safety posters and other literature or notices dealing with this phase of the operation.

"We feel that the credit for the excellent records made at our Rock Hill and Geneva plants during 1929 is due chiefly to the keen interest and earnest effort of the superintendents in charge of these quarries and the safety committees which have cooperated with them so faithfully."



Safety Committee, Rock Hill Plant, General Crushed Stone Co.

What the John T. Dyer Quarry Company Has to Say

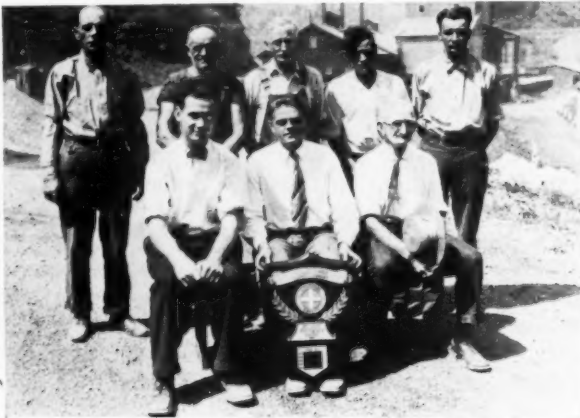
The following was submitted by the John T. Dyer Quarry Company which in addition to winning second honorable mention in the 1929 contest was in the fore-rank in the 1928 contest, having won first honorable mention that year.

"During 1929 the Trap Rock quarry of The John T. Dyer Quarry Co., worked 166,876 man-hours without a lost-time accident, thus continuing their no-accident record through the second consecutive year. In recog-



Quarry Employees, Rock Hill Quarry, General Crushed Stone Co.

dition of this record they were awarded an honorable mention in the safety competition, conducted by the *Explosives Engineer*, among the quarries operated by



Safety Committee, Trap Rock Quarry, John T. Dyer Quarry Co.

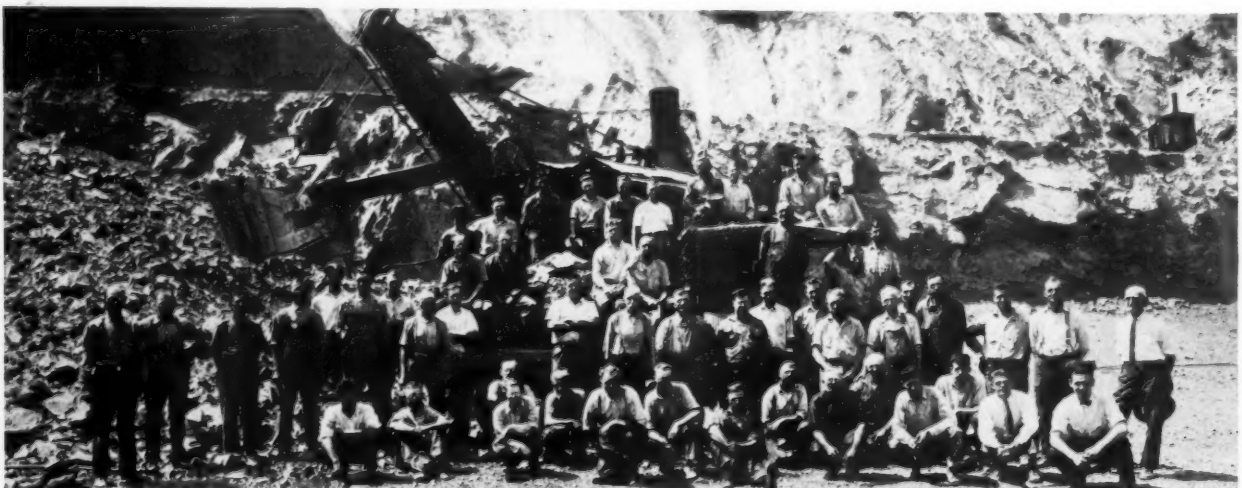
members of the National Crushed Stone Association.

"The safety program at the Trap Rock quarry is conducted by a committee of eight men, composed of the superintendent, foreman, two clerks and men in charge of the various operations. This committee meets monthly with the company Safety Engineer at which time all problems concerning safe conditions and methods are discussed. The company is fortunate in having on this committee men who are sincerely interested in the safety of themselves and their fellow workmen. The success or failure of any program depends to a large extent on the safety committee.

"Particular emphasis in the safety work is placed upon the education of the men. The goal towards which all efforts are directed is the ideal condition when all employees will have safety so firmly fixed in their minds that they will be unconsciously careful in everything they do. No doubt, the ultimate goal will never be reached but any progress in that direction will mean improvement in the accident record.

"Two safety bulletin boards are located at the plant. National Safety Council posters are displayed on one board and are changed weekly. The other board contains space for three posters, two of which pertain to safety or some similar subject and are changed semi-weekly, the third pertains to some topic in the current news and is changed daily. The news item poster has been found successful in drawing the men to the board. The 'Safe Worker' is distributed to the men monthly. Annually a mass meeting is held, on the company's time, for all the men in the Company's employ. There is a large plaque awarded at this meeting to the quarry having the best safety record for the preceding year. Safety guards are erected with two purposes in view, first to guard the men from injury due to the particular hazards they cover and second to serve as a reminder to work safely at all times.

"At the present writing the Trap Rock quarry is working on a new safety record. The no-accident record which extended through 1928 and 1929 was ended shortly after the start of the present year, by an accident causing the loss of twenty-five days. This accident was a keen disappointment to all the men at the quarry and particularly to the unfortunate employee



Quarry Employees, Trap Rock Quarry, John T. Dyer Quarry Company

who was injured. However the record in itself meant nothing. The fact that for something over two years no man had experienced the pain or loss of an injury



Quarry Employees, North Baltimore Plant, France Stone Co.

was the commendable feature involved. The employees realize this and while the breaking of their record caused disappointment it did not cause discouragement and they are still as actively interested in preventing accidents as ever.

"The Trap Rock quarry is, therefore, out of the competition for a perfect record in 1930, but in passing they wish to express their heartiest congratulations to the quarries who enjoyed a no-accident year in 1929 and to also express a sincere hope that their safety activities will all meet the same success during 1930."

Methods Used by the France Stone Company

The France Stone Company won first honorable mention in 1926, fourth honorable mention in 1928 and fifth honorable mention in 1929, which would indicate that their methods have produced real results.

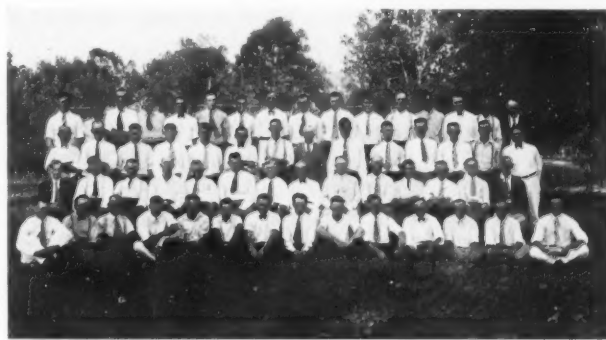


Safety Committee, North Baltimore Quarry, France Stone Co.

"A complete article, if one could be written," writes D. B. Buettner, Jr., of the France Stone Company and affiliated companies, "dealing with accident prevention activities of our organization would be too lengthy for publication in this magazine. The writer has, therefore, confined his statements in this write-up to such procedure and instructions as are furnished to and followed by each plant office.

"Our experience has convinced the management that accident prevention or reduction in frequency and severity is unquestionably of financial gain to the workmen and their employer. If a sincere attempt is made by the employer and his workmen it tends to bring out a closer spirit of cooperation and results in better industrial and home welfare.

"Since much depends on enforcement and discipline of the worker to realize the benefits of this work, the Plant Superintendent is recognized as the Plant Safety



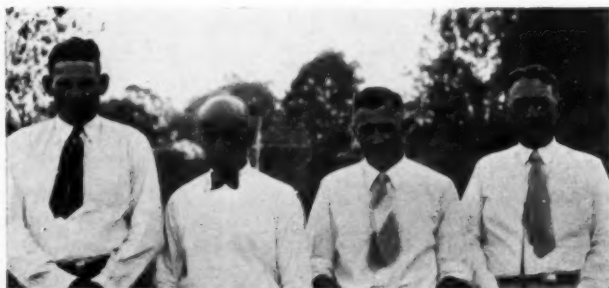
Quarry Employees, Speed Quarry, Louisville Cement Co.

Committee Chairman and he, of course, is as responsible for continuous safety practice at his plant as the production of our product.

"Conducting Safety Meetings: A general plant safety meeting is held once each month and as many plant employees attend this session as possible. The Committee Chairman has the right to call as many additional meetings as he may deem advisable. Such meetings may be called whenever there is a topic, condition, or accident to be discussed or brought to the attention of the employees and result in a better understanding of Safety.

"Permanent Safety Policies: The minutes of all meetings are submitted to the General Office of the companies in our organization and are compiled in detail by the plant clerks, who act as committee secretaries at their respective locations. All matters defining permanent safety policies at the plants are gov-

erned by the General Office of the employer. The General Safety Committee, comprised of officials of the Company, does not hold back or retard the operations or activities of the plant safety organization but acts as a clearing house for recommendations and ideas in order to create just and applicable rules and regulations which bind the entire work together. This eliminates personal or temporary ideas that may harm or hinder safety work progression.



Safety Committee, Speed Quarry, Louisville Cement Co.

"Safety Rules: Formulated after years of study and research, they represent only those instructions that are practical to follow. All employees are to abide by the rules outlined in small numbered booklets furnished each employee immediately after beginning work for us and to which he must pledge himself in writing. These rules are enforced to the fullest extent since each plant discussed them many times at their meetings before their final adoption.

"Safety Inspections: The plant Safety inspection is made at least twice each month (preferably once during the first and once during the third week) before the monthly meeting in order that conditions noted by inspection may be brought up for discussion and disposition. The plant inspector is appointed by the superintendent and is changed from time to time at the discretion of the plant official. A special form pertaining to our industry's hazards must be completed or answered by the inspector as he views the plant and its physical conditions.

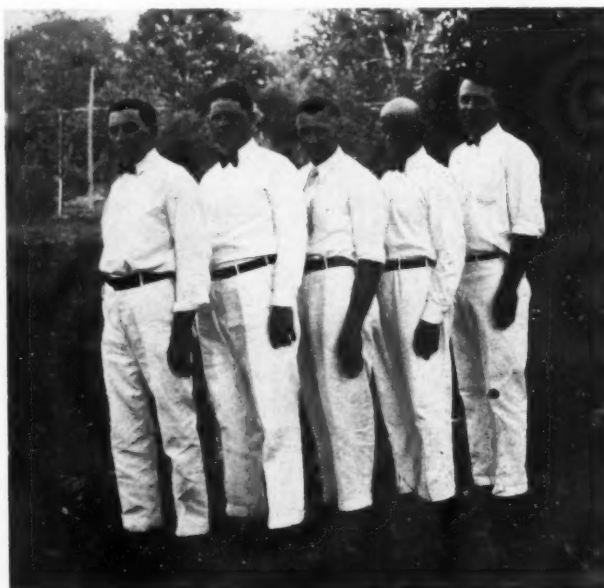
"Investigating Accidents: The word 'accident' in this connection means an injury or a near injury. On each accident report made by the plant office, space is provided for a foreman's investigation. A recent innovation at the majority of our plants calls for an investigation of the case by three employees appointed by the safety chairman. They must determine as near as possible the exact cause and manner of accident, fix the responsibility, and set forth practical recommen-

dations to offset recurrence by way of a written report to the safety chairman. Incomplete or vague reports are returned by General Office with criticisms. This is seldom necessary as the plants usually furnish clear concise information.

"Safety Interest: This is furnished, primarily, by suggestions and discussions of the workers. Periodically posters are mailed to each location dealing with either specific or general conditions. Health articles are sent and news-letters mailed to the plants, also. A plant safety trophy is awarded at the end of each calendar year to the plant having the best safety record. This is held by the plant for the ensuing year. Briefly, this large bronze safety plaque depicts scenes individual to our industry and our workmen. It is held in high esteem by the workmen and a year-plate thereon states the name of each annual winner.

"In closing, the writer is glad to state that there are eight plants in our organization which have not experienced a lost-time accident in the first seven (7) months of 1930. The North Baltimore, Ohio, quarry has gone over twenty-two months without a lost-time injury (an accident to an employee resulting in disability extending beyond the actual day of accident). This location, now possessing the Company Trophy and receiving Honorable Mention in the 1929 National Safety Competition, is still going strong and we find

(Continued on page 24)



First Aid Squad, Speed Quarry, Louisville Cement Co.

We Invite You to St. Louis

ALL of St. Louis extends a welcome to the members of the National Crushed Stone Association and urges them to attend their 1931 Annual Convention so that they may see for themselves a miracle city—the new St. Louis, a rich, modern metropolis, the capital of commerce and industry in the Middle West, but richer yet in glorious tradition and romantic evidence of past generations.

It was on the evening of February 14th, 1764, that a little band of French pioneers first landed on the west bank of the Mississippi River at what is now the foot of Walnut Street in St. Louis. For many days, patiently fighting the current, they had poled and dragged their heavy craft up the great river from Fort de Chartres, sixty miles below. Wearied by their labors, they slept that night on their boat.

Like the Landing of the Pilgrim Fathers, the coming of this "First Thirty," as they became known in colonial days, proved a milestone which marked the beginning of an empire. For when, on the following morning, August Chouteau led his men across the sandy beach and up the plateau overlooking the river, pointing out to them there a line of blazed trees, the ringing blows of axes soon sounded through the woods, and the building of St. Louis began. Then and there was born the spirit of a community.

The previous year a far-sighted engineer named Laclede had conceived the idea of a permanent settlement in some favorable river location. Searching for the ideal spot, he, accompanied by August Chouteau, explored the Mississippi North and South. And, as the still preserved record relates, "he fixed upon this place, marked with his own hands some trees, and said to Chouteau, 'You will come here as soon as navigation opens, and form a settlement after the plan which I shall give you. For here may well develop one of the finest cities in America, since here are such unusual advantages of location and of central geographical position!'"

Those were indeed pioneer days, days when the European powers, England, France and Spain, contended for a continent. At that time neither cities nor towns existed in all the silent wilderness of the Mississippi Valley. Here and there, hundreds of miles apart, roughly stockaded and scantily garrisoned forts constituted the only outposts of civilization, the sole refuge against Indian attacks. Frontier lines—there

were none. Life in the New World was a continual struggle for existence.

Other expeditions, French and Spanish, soon sought to overshadow the little settlement of St. Louis. A Spanish fort was built a short distance to the north. Yet so well had Laclede chosen, and so energetically had his followers labored, that these competitive efforts gradually merged with St. Louis itself. Within three years its colonists, by sheer force of spirit, had established valuable fur-trading monopolies with the twenty-eight principal Indian nations, including not only those west of the Mississippi, but also east of the river and even as far north as the Great Lakes. These the English tried in vain for many years to break.

Within five years the fur trade of St. Louis had grown to the amount of \$80,000 annually, a great sum in those days. That trade was the commercial cornerstone, the basis of prosperity. Every year thereafter saw the city's radius of influence lengthen. Up the Mississippi and Missouri crept a line of outposts. St. Louis became the gateway of the stream of migration, the starting point of expeditions in all directions. Some of these were military, establishing forts; some scientific, to explore and to exploit; more were to establish communities, to open commercial avenues. The Lewis and Clark expedition in 1804, opening the Northwest, was one of these. So, too, the Frenchmen of St. Louis paved the way for the American occupation of Louisiana. A branch of the Chouteaus started Kansas City; Robidoux, of St. Louis, established St. Joseph. One of the Menards founded Galveston. A hundred western cities and towns owe their beginning to St. Louisans.

With the "Louisiana Purchase" in 1803, all that vast stretch of territory which is now the central and southwestern part of this country came into national possession, more than doubling the area of the United States. Meanwhile, St. Louis had steadily grown. Seven years after its incorporation as a city in 1823, its population was 4,977, ranking 44th among American cities. In 1833 it was in 20th position and growing fast.

Missouri became a state in 1821, and, in time, became the central state of all the Union. Two states away, to the south, today, lies the Gulf of Mexico. Two states north is the Canadian line. Five states east is the Atlantic. Five states west, the Pacific.



Municipal Free Bridge, St. Louis—Largest Double Deck Steel Span Bridge in the World

Thus, Missouri, and St. Louis, its chief city, is the geographical heart of the Union, the very center of its life and activities.

Eighteen hundred eleven marked the appearance of the Mississippi Steamboat. Five years later the first steamboat came up the river to St. Louis. For half a century thereafter the river trade grew by leaps and bounds. Just prior to the Civil War this river traffic was at its height. Hundreds of the old-time steamers, their decks piled high with cotton, daily ploughed the Mississippi. The steady, chugging beat of their paddles and the hoarse boom of their giant whistles awoke the echoes throughout the valley. Millions of dollars were invested in the river fleet. St. Louis was at that time the leading city of the West.

On the borderland between North and South, Missouri suffered cruelly from the Civil War, more than one-tenth its battles being fought upon Missouri soil. The great current of traffic, which up to that time flowed north and south, was abruptly broken. The

tides of trade turned east and west, served by rails instead of rivers. During the reconstruction period St. Louis temporarily lagged, yet it soon caught the cadence of the shriller whistles and moved on, losing but one rank in the procession of American cities. And today, the sixth largest manufacturing city, St. Louis, with its eighteen trunk lines operating twenty-seven lines of railroad, has become America's second greatest railroad center, with a reborn river traffic greater than ever dreamed possible, and with developing possibilities which only the most farsighted can conceive.

Getting back to the attractions of St. Louis, because the Mississippi River has played such a significant part in the entire history of our city, it is perhaps one of the first things that the visitor wishes to see. With its tugs and steamboats, its barges and tows, its pleasure crafts, its ferry boats and mighty bridges, all flanked by the elevated railroad and the skyscrapers of the nearby business district, it presents an unforgettable picture. The old section of St. Louis adjacent to the river, still interesting, forms the district refer-

red to by Charles Dickens in his "American Notes" as the "French Quarter."

The visitor will find of interest a remarkable collection of the records of the early history of St. Louis and Missouri which are housed in the Jefferson Memorial, an imposing marble structure in Forest Park which stands on the site of the main entrance of the World's Fair. The collections include relics of the Mound Builders—whose faces no white man ever saw; curios of the Indian tribes who traded with the founders of St. Louis; original manuscripts of the French and Spanish days in Missouri; relics of the pioneers and of the Revolutionary, Mexican, Spanish-American and World Wars; and ancient records of Missouri courts which fixed titles to land and handed down decisions

of importance in the early history of St. Louis and its vicinity.

In addition to the third largest collection of Jefferson manuscripts in this country, a large portion of the manuscripts of the Hamilton-Burr controversy, which culminated in the death of one and the destruction of the career of another brilliant man, are exhibited here.

Many of the manuscript records of the Lewis and Clark Expedition repose in the display cases. The letter of credit given to Lewis and Clark is the only one of its kind ever given by a President of the United States to an individual. It carried the credit of the United States Treasury for expenditures incurred.

Among the exhibits in the Memorial and of supreme
(Continued on page 24)



Airplane View of the Business District of St. Louis

Methods Required to Produce Enduring Smoothness in Bituminous Macadam Surfaces¹

BY B. E. GRAY,

Division Engineer, State Road Commission of West Virginia

ANYONE who has travelled widely over the United States must admit that there is a wide variation in the quality of bituminous pavements. Much of the criticism directed against black top has been justified, not as a result of bad specification or poor material, but because of either lack of intelligence or the necessary will to carry on the construction in a proper manner. All too frequently macadam roads have been built as if they were to be temporary surfaces; a wrong attitude to begin with. Any improvement to a state highway should be with the idea that stage construction is possible, and that as traffic increases, the surface may be strengthened and widened utilizing all previous work. This means that even for low cost roads, careful attention should be given to alignment and grade, and with drainage structures properly placed to take care of future changes with minimum cost. There is no reason to slight work just because funds are limited; on the contrary, the best engineering talent should be employed to obtain maximum results from these limited expenditures.

As in every other phase of human endeavor, there is usually a reason for any particular set of conditions, and in the construction of macadam types, poor results come about largely because of too little insistence in the observance of fundamental principles, and the hope (if it may be so termed) that in some way a good surface would finally happen. It is all very well for a group of executives to get together and write a set of specifications for methods and materials. It is quite another, to go back home and build an organization of engineers and inspectors to carry them into practice, especially with the "feast or famine" condition that exists in public work. And yet it is upon the inspector that success or failure largely depends, and he must be sold on the need for doing work as planned, and imbued with a desire to obtain quality results; never satisfied with anything less.

¹ *Safety Engineering*, April, 1930.

History

Early macadam roads were built by laying either crushed or knapped stone upon road beds which had been stabilized under horse-drawn traffic. The layer of stone was filled with screenings, and then water bound and rolled. Under iron tired traffic there was gradual wear so that additional dust was continually being worked into the voids, and over a period of years these surfaces became very firm and fairly smooth. Any serious variations were repaired by adding fine stone and additional screenings, and for the slow moving traffic, no particular need was felt for extremely even surfaces.

With the advent of the automobile, such surfaces deteriorated very rapidly due to tire suction and consequent loss of filler. The first experiments with surface treatment brought widely varying results, but in general they were satisfactory, and adequate for motor vehicle speeds of not over 25 miles per hour. With the further growth of traffic, rapid extensions of roads were made. The old methods of construction were still followed, and on new road beds, much settlement occurred, until in many instances macadam types obtained a bad name because of roughness. No particular requirement was made as to checking sub-grade and base, it being generally thought that all irregularities could be taken out when the top-course was placed. It is needless to add that experience soon showed that such conclusions were erroneous, and resulting from the experience gained over the intervening years, state highway specifications have been written, which now take into account the absolute necessity of giving as close attention to every step in the construction of a macadam surface, as for the most costly pavement.

Present Method

West Virginia specifications of 1929 call for sub-grade to be prepared in accordance with profile, grade

and cross-section, with variations not to exceed $\frac{1}{4}$ inch in 10 feet of length. Before placing any stone, the sub-grade is to be thoroughly rolled, all weak or soft places to be stabilized with solid material, and the entire area to be checked prior to placing any stone. Specifications for the stone call for a product of uniform quality, proper grading, and size. Extreme care is taken in placing base-course to see that uniform depth is obtained, and the surface is closely checked. Every care is then taken to see that the base-course is *thoroughly* filled with stone screenings and dust, in order that all voids shall be full and no movement in the base-course possible. It is preferable that new base-course shall be constructed one year, and top-course laid the year following. There is a decided tendency to change the specifications and methods of construction so as to follow this plan.

Where the base-course is laid one year and then opened to traffic through the following winter, the surface be treated with asphalt in two applications, the first consisting of $\frac{1}{4}$ gallon asphalt primer coat, which is readily absorbed and requires no cover, and the second application of $\frac{1}{4}$ gallon cold liquid asphalt applied several weeks afterward and covered with approximately 20 pounds of chips. In no case should base-course be laid upon road-beds graded the same year (unless absolutely necessary), as some settlement is bound to occur with resulting distortion of the surface.

Somebody has said that "Genius consists of an infinite capacity for taking pains," and certainly the construction of macadam pavements of extra smoothness depends entirely upon such attention. To insure high quality, several additional types of equipment have been devised, and successfully used during the past season. The old time straight edge, of course, together with the template for obtaining proper cross-section, are used constantly on both sub-grade, base-course, and top. After surface treatment of the base-course, and prior to placing the top, an additional instrument has been tried, known as the "Grade-Rater." This is a wooden frame, approximately 10 feet in length, with a small wheel at each end, and in the center a metal pointer which drags on the surface of the pavement, and indicates any variation (in fractions of an inch) on the scale at the top. The machine is operated with a pair of light plow handles, and the scale is readily visible to the operator. The method is to push the machine longitudinally with the road, and whenever the scale indicator shows a variation beyond the

specification tolerance, a chalk mark is made indicating the high or low area. The "Grade-Rater" is run down and back twice on either side of the center so as to cover every four-foot interval of width. All areas which vary from the true surface are patched before placing the top-course. In making these patches, the greatest care should be taken to use a minimum amount of asphalt, in order that no change in texture may occur. It is *essential* that the base-course conform exactly to the desired cross-section and profile, if the final surface is to remain smooth.

The same care is taken in placing top-courses; first, to obtain a uniform material with the densest possible grading, and then to follow the same procedure of checking for irregularities before the final seal coat. One of the most common faults in construction is the tendency to use too much bituminous material. If the surface appears to be somewhat irregular in color, dry, and with even a number of small pittings, there is nothing to worry about, as it can be easily corrected with the final seal coat. On the other hand, a surface which has a very black, totally flushed appearance, is quite apt to be too rich, and with the application of the seal coat corrugations result. Prior to the seal coat, the "Grade-Rater" is again run over the surface to check all variations, from standard, and all low places are again patched, using the minimum possible amount of bitumen. It is during this process of checking, adjusting, and patching, that the greatest difficulty usually occurs with the contractor, and it is a time when the inspector needs to exercise all of his tact and patience and yet at the same time to be persistent and insistent that his instructions are carried out.

It is desirable that several weeks to several months elapse before the seal coat is applied. This gives an opportunity for settlement and compaction of the top-course, and for all spongy, loose areas, to whip out under traffic, thus leaving solid surface on which to apply the final application of bituminous material. This final application is $\frac{1}{4}$ to $\frac{3}{8}$ gallon cold liquid asphalt, but which is heated to about 100 degrees F. A sufficient amount of $\frac{3}{4}$ inch chips is applied to take up all surplus bitumen, and here again a new machine has been employed with satisfactory results. It is difficult (even with experienced operators) to apply chips from stock piles in an absolutely uniform manner. The several chip spreaders (which have been used) also produce results that vary considerably between the beginning and the ending of the load. To overcome this difficulty, the following instrument has been

devised. It consists of a triangular frame made of steel, supported on wheels at each corner, with a cross member to which is attached a 10-foot length of wire brooms. This cross member may be moved vertically to obtain any desired pressure of the brooms on the surface. It is operated immediately after the application of chips, producing a uniform distribution over the surface, thus overcoming any tendency to bunching. While at first thought it would appear to be of minor importance, yet it contributes that extra refinement which results in a perfect surface.

To substantiate the conclusions set forth above, an experiment in construction was made during the past summer on U. S. Route 50 crossing the Allegheny Mountains. This section is 10 miles in length, the roadway having been previously graded and all drainage structures installed during 1923-24. Through the intervening years, constant maintenance has been carried on, so as to produce an entirely stable, graded earth road. Contracts were let for this ten-mile section, divided in two five-mile parts, one being for crushed stone base, and the other for knapped stone base. Work proceeded simultaneously on the two sections, and they were completed nearly at the same time. The grade was so laid as to require trenching from one end of the job to the other, thus putting the sub-grade in thoroughly compacted material; maintaining the full roadway width, and in addition providing a surplus of berm material so that no disfiguring robbing of the slopes was necessary. The precaution set forth above, such as checking sub-grade, stabilizing weak spots, placing the base-course with carefully graded, uniform material, insistence upon thorough filling and rolling, checking with straight edge and template to the specification tolerance, were all carried out. Just prior to the completion of the base, a single contract was let for the full ten-mile length of top-course, the type being "puddle macadam," three inches compacted thickness, 18 feet in width, and with a two inch crown.

This surface was laid under traffic, full width, with only a temporary barricade during the few minutes required to pour the first application of one-gallon per square yard. The method of constructing "puddle macadam" has been previously described in a paper before the Highway Research Board, December, 1927. An experiment was made this summer, however, using asphalt primer coat for the initial application. It had been thought previously that insufficient penetration would be obtained using this material, but on the con-

trary a penetration of $1\frac{1}{2}$ inches was had within two hours after application. Practically no cover coat was required, other than just enough to prevent picking up of the surface. Rolling was delayed for about an hour after application, and then made once over to obtain initial compaction. Rolling continued at intervals of several days thereafter, as the asphalt residue hardened, to keep the surface in shape. The results were very satisfactory, and this material will be specified for future work. The pavement was laid at the rate of about 1500 linear feet per day, and all of the precautions for testing the surface were carried on as above noted, the inspector being an unusually persistent individual, and contrary to the recommendation of one of our great industrial leaders, a man of about 60 years of age. He was on the job at 7:00 a. m., and did not leave until after the contractor at night, a quality not always found with some of our younger college graduates. Traffic used this surface for several months prior to the seal coat, and while very little asphalt had flushed the surface, and a certain amount of shallow pitting occurred, this was not at all harmful. The final seal coat consisted of $\frac{3}{8}$ gallon cold liquid asphalt, heated to maximum fluid condition, covered with approximately 20 pounds of chips, and dragged with the steel broom as outlined above.

Results

Shortly after this contract was finished, the remaining gap on U. S. 50 in Maryland was also completed, and immediately thereafter a large increase in traffic took place, so that an excellent opportunity has been had during the past two months to determine the riding qualities of the macadam section after being subjected to concentrated high speed traffic.

For the past year our roads have been checked with a roughometer every two or three months to determine their relative smoothness and whether or not they are changing in their riding qualities. Previously built macadam with good smooth riding surfaces have had an index of 100 to 150. Good riding concrete built in previous years has run between 75 and 125. These are pavements that two or three years ago were considered of good quality in smoothness and easy riding. The index for the ten miles constructed with the methods outlined above is between 50 and 60 for the crushed stone base section, and from 55 to 65 for the knapped stone base. Even with every precaution, it is not possible to obtain the same smoothness with knapped

(Continued on page 22)

Crushed stone and broken stone produced in continental United States, 1927 and 1928, by regions¹

Region	Concrete, road metal, and railroad ballast										Other uses		
	1927				1928				1927				
	Short tons	Value f. o. b. plant		Per cent of regional total quantity	Per cent of regional total quantity	Short tons	Value f. o. b. plant		Per cent change		Short tons	Value f. o. b. plant	
		Total	Average				Total	Average	Quantity	Average value		Total	Average
Eastern States:													
Granite.....	1,205,370	\$2,019,633	\$1.68			1,152,350	\$1,926,397	\$1.67	-4.4	-6	226,730	\$275,404	\$1.21
Basalt (trap rock).....	8,818,910	11,782,520	1.34			10,104,650	13,089,757	1.30	+14.6	-3.0	74,900	336,529	4.49
Limestone.....	14,831,140	18,527,140	1.25	67.5	68.4	15,130,740	18,337,060	1.23	+2.0	-1.6	11,588,980	11,769,625	1.02
Sandstone.....	834,730	1,083,694	1.30			846,890	1,128,266	1.33	+1.5	+2.3	638,400	798,202	1.25
Miscellaneous.....	570,910	1,096,528	1.92			793,950	1,248,649	1.57	+39.1	-18.2	145,280	581,763	4.00
	26,261,060	34,509,515	1.31	67.5	68.4	28,028,580	35,930,129	1.28	6.7	-2.3	12,674,290	13,761,523	1.09
Central States:													
Granite.....	258,910	437,146	1.60			228,150	316,363	1.39	-11.9	-17.8	10,590	14,826	1.40
Basalt (trap rock).....	374,580	498,180	1.33			190,920	242,828	1.27	-49.0	-4.5	60,820	413,672	6.80
Limestone.....	33,760,530	30,915,351	.92	66.6	63.5	32,246,420	29,649,045	.92	-4.5		17,133,260	12,448,682	.73
Sandstone.....	575,410	643,835	1.12			236,360	248,294	1.05	-58.9	-6.3	384,370	500,629	1.30
Miscellaneous.....	42,510	65,502	1.54			133,680	166,382	1.24	+214.5	-19.5	23,130	21,908	.95
	35,011,940	32,560,014	.93	66.6	63.5	33,035,530	30,622,912	.93	-5.6		17,612,170	13,399,717	.76
Southern States:													
Granite.....	3,769,930	5,077,066	1.35			3,895,560	4,794,705	1.23	+3.3	-8.9	74,610	125,136	1.68
Basalt (trap rock).....	138,020	133,353	.97			148,730	163,224	1.10	+7.8	+13.4			
Limestone.....	16,080,610	13,525,254	.84	90.5	88.0	12,895,750	10,598,446	.82	-19.8	-2.4	1,990,700	2,498,439	1.26
Sandstone.....	93,000	61,133	.66			169,560	139,259	.82	+82.3	+24.2	66,230	88,231	1.33
Miscellaneous.....	834,610	796,970	.95			385,660	407,051	1.06	-53.8	+11.6	136,530	155,809	1.14
	20,916,170	19,593,776	.94	90.5	88.0	17,495,260	16,102,685	.92	-16.4	-2.1	2,263,070	2,867,615	1.26
Western States:													
Granite.....	2,182,650	1,360,356	.62			1,663,250	1,337,568	.80	-23.8	+29.0	1,188,280	1,023,842	.86
Basalt (trap rock).....	3,029,830	2,840,320	.94			3,943,040	4,174,257	1.06	+30.1	+12.8	203,910	298,794	1.47
Limestone.....	309,650	283,977	.92	79.0	81.6	613,440	417,288	.68	+98.1	-26.1	1,336,130	1,308,248	.98
Sandstone.....	1,329,090	1,121,779	.84			1,363,850	1,329,972	.98	+2.6	+16.7	523,510	567,242	1.08
Miscellaneous.....	5,455,000	4,466,940	.81			4,646,810	3,473,738	.75	-15.3	-7.4	34,910	269,114	.77
	12,336,220	10,073,372	.82	79.0	81.6	12,230,390	10,732,823	.88	-9	+7.3	3,286,760	3,467,240	1.05
United States total.....	94,525,390	96,736,677	1.02	74.5	71.0	90,789,760	93,388,549	1.03	-4.0	+1.0	35,841,290	33,496,095	.93

Crushed stone and broken stone produced in continental United States, 1927 and 1928, by regions—Continued

Region	Other uses—Continued				Total							
	1928				1927				1928			
	Short tons	Value f.o.b. plant		Per cent change	Short tons	Value f.o.b. plant		Per cent of United States total quantity	Short tons	Value f.o.b. plant		Per cent change
		Total	Average			Total	Average			Total	Average	
Eastern States:												
Granite.....	239,320	\$215,025	\$0.90	+5.6	1,432,100	\$2,295,037	\$1.60		1,391,670	\$2,141,422	\$1.54	-2.8
Basalt (trap rock).....	100,790	455,577	4.52	+34.6	8,893,810	12,119,049	1.36		10,205,440	13,545,334	1.33	+14.7
Limestone.....	11,877,390	11,516,877	.97	-2.5	26,420,120	30,296,765	1.15	30	27,008,130	30,053,937	1.11	+2.2
Sandstone.....	628,000	803,121	1.28	-1.6	1,473,130	1,881,896	1.28		1,474,890	1,931,387	1.31	+2.3
Miscellaneous.....	126,800	498,488	3.93	-12.7	716,190	1,678,291	2.34		920,750	1,747,137	1.90	+28.6
	12,972,300	13,489,088	1.04	+2.4	38,935,350	48,271,038	1.24	30	41,000,880	49,419,217	1.21	+5.3
Central States:												
Granite.....	73,020	53,636	.73	+589.5	269,500	451,972	1.68		301,170	369,999	1.23	+11.8
Basalt (trap rock).....	42,800	298,500	6.97	-29.6	435,400	911,852	2.09		233,720	541,328	2.32	-46.3
Limestone.....	18,429,740	13,396,872	.73	+7.6	50,893,790	43,364,033	.85	40	50,676,160	43,045,917	.85	-4
Sandstone.....	376,060	612,820	1.63	-2.2	959,780	1,144,464	1.19		612,420	861,114	1.41	-36.2
Miscellaneous.....	7,480	10,496	1.40	-67.7	65,640	87,410	1.33		141,160	176,878	1.25	+115.1
	18,929,100	14,372,324	.76	+7.5	52,624,110	45,959,731	.87	40	51,964,630	44,995,236	.87	-1.3
Southern States:												
Granite.....	150,060	166,666	1.11	+101.1	3,844,540	5,202,202	1.35		4,045,620	4,961,371	1.23	+5.2
Basalt (trap rock).....	2,180	4,810	2.21	-2.7	138,020	133,353	.97		150,910	168,034	1.11	+9.3
Limestone.....	1,937,620	2,369,396	1.22	-2.7	18,071,310	16,023,693	.89	18	14,833,350	12,967,842	.87	-17.9
Sandstone.....	110,320	151,740	1.38	+66.6	159,230	149,364	.94		279,880	290,999	1.04	+75.8
Miscellaneous.....	220,600	221,582	1.00	+61.6	971,140	952,779	.98		606,260	628,633	1.04	-37.6
	2,420,760	2,914,194	1.20	+6.7	4,183,240	22,461,391	.97	18	19,916,020	19,016,879	.95	-14.1
Western States:												
Granite.....	515,820	432,727	.84	-56.6	3,370,930	2,384,198	.71		2,179,070	1,770,295	.81	-35.4
Basalt (trap rock).....	159,160	232,266	1.46	-22.0	3,233,790	3,126,114	.97		4,102,200	4,406,523	1.07	+26.9
Limestone.....	999,240	1,130,159	1.13	-25.2	1,645,780	1,592,225	.97	12	1,612,680	1,547,447	.96	-2.0
Sandstone.....	432,860	545,678	1.26	+16.7	1,852,600	1,689,021	.91		1,796,710	1,875,650	1.04	+3.0
Miscellaneous.....	632,460	358,235	.57	+171.7	5,519,910	4,736,054	.86		5,279,270	3,831,973	.73	-4.4
	2,739,540	2,699,065	.99	-16.6	15,622,980	13,540,612	.87	12	14,969,930	13,431,888	.90	-4.2
United States total.....	37,061,700	33,474,671	.90	+3.4	130,366,680	130,232,772	1.00	100	127,851,460	126,863,220	.99	-1.9

¹ Reprinted from "Stone, 1928," published by the U. S. Bureau of Mines.

The Crushed Stone Journal

Official Monthly Publication of the
NATIONAL CRUSHED STONE ASSOCIATION, INC.
Merchandise Building 1735 Fourteenth St., N. W.
WASHINGTON, D. C.

J. R. BOYD, Editor

Officers
and
Executive Committee



National
Crushed Stone
Association

OFFICERS

W. F. WISE, President
Southwest Stone Co., Dallas, Texas
F. T. GUCKER, Treasurer
John T. Dyer Quarry Co., Norristown, Pa.
J. R. BOYD, Secretary
Washington, D. C.

A. T. GOLDBECK, Director, Bureau of Engineering
Washington, D. C.

REGIONAL VICE-PRESIDENTS

C. M. Doolittle (Canadian)	Allen Patterson (Central)
Paul C. Graham (Western)	W. R. Sanborn (Northern)
Harry Landa (Southwestern)	T. I. Weston (Southern)
A. S. Lane (Eastern)	Porter W. Yett (Northwestern)

EXECUTIVE COMMITTEE

W. F. WISE, Chairman	
W. M. Andrews	O. M. Graves
H. E. Bair	E. J. Krause
C. M. Doolittle	A. L. Worthen

Popularity of Journal Increasing

THAT the technical articles published periodically in *The Crushed Stone Journal* are being accorded the recognition which we feel they properly deserve should be of distinct interest and a source of gratification to our members, and in this connection the comments of Thomas E. Hegarty of the Portland Cement Association should be of particular interest. Mr. Hegarty writes in part as follows:

"Dear Sir: I would appreciate your sending to me two copies each of the April and June issues, 1929, of *The Crushed Stone Journal*. There are two articles in these issues devoted to the effect on the strength and quality of concrete by the size and shape of the aggregates, and several times I have used these articles in my work. In truth I can say that I consider your *Journal* the best in the field today, and look forward to reading it each month."

N. C. S. A. 1929 Safety Contest Shows Real Progress in Accident Prevention

ELSEWHERE in this issue there are given the results of the National Crushed Stone Association's 1929 safety contest, which it will be recalled is held among the members of the Association who enter their plants in the National Safety Competition sponsored by the *Explosives Engineer* and held under the supervision of the U. S. Bureau of Mines.

The National Crushed Stone Association Safety Contest was inaugurated in 1926 and has been held each successive year since then. In the contest for 1926 only two plants, the Speed quarry of the Louisville Cement Company, located at Speed, Indiana, and the Monroe limestone quarry of the France Stone Company, completed the year with no lost-time accidents. In 1927 three plants made perfect records, in 1928 five plants and in 1929 six plants enjoyed that distinction. This evidence clearly indicates that today accident prevention is being taken much more seriously by the members of the National Crushed Stone Association than was the case back in 1926. It also indicates that the impression that the occurrence of accidents in our industry was a necessary evil and that to completely eliminate them was practically an impossibility is by no means a correct one. When in the course of four years we advance from having only two companies complete the year with a perfect record to having six companies accomplish this result, no one can deny that excellent progress in the prevention of accidents has been made.

We have a still further indication of the interest which the quarrying industry as a whole takes in this very necessary work. We understand that during the last year the number of members of the Quarry Section of the National Safety Council has practically doubled as compared to the figures at this time last year, and that which it is particularly gratifying to note, is that not only are the larger companies of the industry becoming aroused to the benefits to be obtained from accident prevention but this feeling is rapidly spreading to the medium sized and small companies.

As in the past it will continue to be a policy of the National Crushed Stone Association to exert every possible effort to further what we necessarily consider to be one of the fundamental objectives of the Association, the prevention of accidents. We should in no sense permit our enthusiasm to lull in this regard, but should keep going forward as we have in the past

to eliminate accidents from our industry. If in four years we have been able to go from two companies with no accidents to six, who will predict the degree of improvement which it will be possible for us to make during the coming years?

The N. C. S. A. Convention Special

TO those who have had the pleasure of traveling to our past conventions via the special train, the announcement will be most welcome that arrangements are now in course of preparation for the special train which will take our delegates from the East to the St. Louis Convention. Much of the enjoyment of the convention is participated in by traveling to the convention via the special train.

Although complete arrangements have not as yet been made regarding the schedule it is anticipated at the present time that the train will leave New York about 3:40 P. M., on Saturday, January 17, arriving in St. Louis about 5:30 P. M. on Sunday, January 18. This train will pass through Harrisburg, Pittsburgh, Columbus and Indianapolis, at which places special cars will be added to accommodate the delegates from each of these territories. A feature that has not been in effect before will be the running of one or more cars, as may be necessary, from Boston and New Haven to New York which will directly connect to the special train, thus obviating the necessity of the delegates from the New England territory having to change cars in New York. The usual high standard of equipment will be maintained on this train, including club car, observation car and special dining car. All of those who may be interested in traveling to the convention via the Special will be advised direct, somewhat later, as to the detailed arrangements and it is hoped that even if at slight inconvenience as many as possible will arrange to take advantage of the Special as their means of transportation to the convention.

Suggestion Box

It is proposed at the forthcoming convention to place a suggestion box at the registration desk into which all of those who are at the convention can drop cards on which they have noted suggestions for the improvement of the convention. Such suggestions, however, would only be of value in making arrangements for our 1932 convention and it has occurred to us that many of our members may have some definite ideas as to how we might improve arrange-

ments for the St. Louis Convention. Therefore the suggestion is here made that you do not wait until the St. Louis Convention to make suggestions, but if you have in mind anything which you believe would be of value and assistance to the officers and Washington Staff in arranging for our next annual meeting, by all means send such information in to the Washington Office at your earliest convenience. It will, of course, always be our earnest and sincere desire to plan and operate our annual meetings in full accord with the wishes of the membership. It is, however, not always possible to know whether or not we are meeting your wishes in this respect. We also appreciate that there is inherently a certain amount of reluctance on the part of our members to criticize, but we give you positive assurance that constructive criticism is always welcome and in fact necessary if our annual meeting is to continue to be that instructive and interesting event which is our constant goal.

The Business Situation in the Construction Industry

FROM the pamphlet entitled, *The Business Situation*, September 29, 1930, issued by the Chamber of Commerce of the United States and prepared under the supervision of Julius H. Barnes, Chairman, National Business Survey Conference, we quote the following interesting comments:

"For the period ended with September 19, construction of public works and utilities exceeded the volume in the same part of last year by \$147,000,000, non-residential building this year was less in volume by \$341,000,000, and residential building was less by \$698,000,000. Total building contracts for all classes this year through September 19 were \$3,574,000,000, to be compared with \$4,467,000,000 in the corresponding part of 1929 and \$5,126,000,000 in this part of 1928. The greatest decrease has been in residential building; in this form of construction there have been indications of a moderate revival, within the last few weeks, particularly in construction of detached one and two-family houses.

"Awards for concrete paving in August totaled 10,657,000 square yards, as compared with 11,968,000 in August, 1929. During the first eight months of this year such awards have exceeded the volume in the corresponding part of 1929 by 7.2%. At the beginning of September, contracts awaiting award totaled 11,309,000 square yards, or 19% more than the corresponding figure on September 1, 1929."

Counties Improved 45,481 Miles of Highways in 1929, Reports Show

A TOTAL of 45,481 miles of local and county roads, exclusive of State highways, were improved in 1929 by the counties of the 48 States, it is indicated by reports obtained from authorities of selected counties by the Bureau of Public Roads, U. S. Department of Agriculture. These reports indicate a total of 2,710,097 miles of highway in the county road systems.

The reports indicate that all counties spent a total of \$807,714,604 in the year for county and local road and bridge construction, including payments on bonds and transfers to State highway departments. It is estimated that available funds amounted to \$953,529,592. An unexpended balance of \$145,814,988 was on hand at the end of the year.

Of the total mileage improved in the year, the reports indicate 29,804 miles, or 66 per cent, were surfaced, and 15,677 miles, or 34 per cent, were graded and drained earth roads. The surfaced mileage includes 2,905 miles of sand-clay and topsoil roads; 19,753 miles of gravel; 3,666 miles of waterbound macadam; 2,037 miles of bituminous macadam; 54 miles of sheet asphalt; 176 miles of bituminous concrete; 1,191 miles of Portland cement concrete; and 22 miles of brick and other block pavements.

The estimated total mileage in the county road systems includes 454,111 miles of surfaced highways, including 416,770 miles of low-type and 37,341 miles of high-type surfacings. The low-type surfacings include 75,547 miles of sand-clay and topsoil; 292,463 miles of gravel; and 48,760 miles of water-bound macadam. The high-type surfacings include 16,692 miles of bituminous macadam; 1,539 miles of sheet asphalt; 4,057 miles of bituminous concrete; 13,254 miles of Portland cement concrete; and 1,799 miles of brick and other block pavements.

The reports from the selected counties indicate that all the counties of the States spent \$256,581,811 for construction; \$260,477,801 for maintenance; and \$49,455,959 for miscellaneous items; that they paid out \$78,277,070 for interest on outstanding bonds and notes, and \$106,032,780 in retirement of the principal on the bonds and notes, and transferred \$56,889,183 to the States for work on State roads. The total disbursement is estimated to have been \$807,714,604.

The reports indicate that all counties had an estimated total of \$953,529,592 in available funds, consisting of an unexpended balance of \$163,401,207 car-

ried over from the previous year, and a total income of \$790,128,385. To the total income, the motor vehicle license fees and gasoline tax receipts allotted to the counties, \$51,886,324 and \$70,492,878 respectively, contributed 15 per cent; receipts from local bond sales, amounting to \$110,635,146, supplied 14 per cent; and the total road tax of \$414,152,567 contributed 52 per cent. Appropriations from county general funds for the use in road work amounted to \$75,018,526; transfer of funds from State to counties for local road work amounted to \$31,714,578.

Hyde Apportions Highway Funds As Emergency Employment Aid

SECRETARY of Agriculture Hyde recently authorized the apportionment of the Federal funds for highway improvement in the fiscal year ending June 20, 1932. This will make it possible for the States to anticipate the Federal funds which will be paid to them next July and will enable them to expand and advance their highway programs at once and so provide emergency employment for a considerable number of men who might otherwise be destitute as the result of crop failures.

Congress has appropriated \$125,000,000 for the fiscal year which will begin July 1, 1931. After deduction of the 2½ per cent allowed for administrative expense, Secretary Hyde was able to allot \$121,875,000 to the several States and to Hawaii. Because drought conditions are confined to only part of the States, and a balance of previous allotments remains unobligated to the credit of several of the States, the Secretary will use his discretion as to the approval of projects and will expedite the approval of projects complying with the following conditions:

1. That the State has obligated and has under construction all or practically all of the Federal aid funds previously allotted.
2. That State funds be required for each project in an amount sufficient to meet the Federal aid funds on the legally established basis. This would not exclude the voluntary contribution of additional county or local funds but would require the State itself to provide a minimum amount equal to the Federal pro rate required, basically fifty per cent Federal funds.
3. That the State Highway Department submit with each project statement a reasonable showing that the

project if expedited would assist in providing employment in the drought areas or would directly contribute to the relief of unemployment in a substantial way. The authority for exercise of administrative discretion in the approval of projects is found in various sections of the Federal highway legislation.

Although the emergency road work is expected to be done in only those States that are suffering from unemployment and from the drought, the apportionment for all the States had been made and is as follows:

State	Sum apportioned	State	Sum apportioned
Alabama	\$2,615,434	Nebraska	2,644,726
Arizona	1,768,023	Nevada	1,598,987
Arkansas	2,174,786	New Hampshire	609,375
California	4,181,212	New Jersey	1,565,749
Colorado	2,315,948	New Mexico	1,984,363
Connecticut	792,359	New York	6,002,475
Delaware	609,375	North Carolina	2,871,722
Florida	1,543,232	North Dakota	2,001,841
Georgia	3,316,029	Ohio	4,584,440
Hawaii	609,375	Oklahoma	2,922,569
Idaho	1,554,594	Oregon	1,997,569
Illinois	5,150,396	Pennsylvania	5,517,738
Indiana	3,172,253	Rhode Island	609,375
Iowa	3,330,593	South Carolina	1,769,848
Kansas	3,397,874	South Dakota	2,054,077
Kentucky	2,356,367	Tennessee	2,687,123
Louisiana	1,745,445	Texas	7,620,239
Maine	1,121,860	Utah	1,416,493
Maryland	1,051,714	Vermont	609,375
Massachusetts	1,813,916	Virginia	2,379,788
Michigan	3,652,393	Washington	1,940,922
Minnesota	3,497,306	West Virginia	1,324,680
Mississippi	2,209,509	Wisconsin	3,075,234
Missouri	3,957,287	Wyoming	1,568,607
Montana	2,580,405		
		Total	\$121,875,000

Ohio Claims Lead in Highway Contracts

OHIO leads the Nation in the value of Federal and State highway contracts awarded this year, according to a statement issued by the highway director, Robert N. Waid, the amount being in excess of \$20,000,000.

"Ohio was one of the first and outstanding States," the director said, "to meet the request of President Hoover for an enlarged program of public improvements. The State needed the good roads, bridges and general improvements that are now being built. It had the money to finance the work, and opportunity and determination, combined with all-the-year-around awarding of contracts, splendid results are now evident and most gratifying to the public as well as to administrative officials responsible for the result."

**Quarrymen
send today for**

BLASTERS' HANDBOOK

DU PONT

SIXTH EDITION

EXPLOSIVES must not only be properly made, but must also be properly stored, carefully handled, and properly used.

In the course of the one hundred and twenty-eight years that the du Pont Company has been engaged in the manufacture of explosives, it has gained a wide knowledge of the storage, handling and use of explosives and it makes a practice of sharing this knowledge freely with its customers.

To this end, we offer the new Blaster's Handbook, containing the latest data on explosives.

E. I. DU PONT DE NEMOURS & COMPANY, Inc.
Explosives Department, Wilmington, Delaware

LONGER LASTING SCREENING**ROK-TEX**

Woven for dependable service, every part that goes into the manufacture of "Buffalo" Wire ROK-TEX is planned to withstand all the hard knocks connected with stone screening. *Actual working tests have proved ROK-TEX has from 50% to 200% longer life than ordinary wire screening.*

Write for quotations, samples and full information

BUFFALO WIRE WORKS CO.
INCORPORATED

(Formerly Scheeler's Sons, Est. 1869)

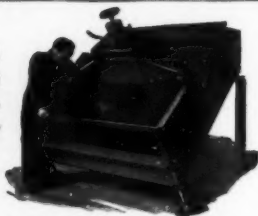
585 Terrace

Buffalo, N. Y.

HUM-MER Electric SCREEN

Screens from
coarsest to the
finest materials—
either wet or dry

*Catalogue sent
upon request*



The W.S. TYLER COMPANY • Cleveland Ohio.

WOVEN WIRE SCREEN

FLEXCO

HD Belt Fasteners

These well known fasteners stop trouble with elevator and tight belt conveyor joints. They have far more strength than needed and the pull is equalized on both sides of the belt insuring long service. Note recessed plates which embed in and compress the belt instead of pulling against the bolt holes. Stocked by leading jobbers in 5 sizes. Consultation invited.

Flexible Steel Lacing Company
4625 Lexington Street Chicago, Illinois
Recommended by leading belt manufacturers

for Conveyor Belts

Methods Required to Produce Enduring Smoothness in Bituminous Macadam Surfaces

(Continued from page 16)

stone, and it is probable that any deterioration in riding qualities will be more marked for the knapped stone than for the other. The index is arrived at from the amount of spring deflection over a mile of road at 25 miles per hour, so that the lower the index, the smoother the surface. Hundreds of miles of road have been checked with this instrument, under all conditions of weather and temperature, so that good calibration is had, and while the results are not absolute, yet their comparative values are certain. Car speeds on this 10-mile stretch have run as high as 60 to 80 miles per hour on tangents, and while such speeds are by no means encouraged, yet the public derives a certain satisfaction in having pavements on which they can drive fast if desired. The many compliments received on this road further prove that the public is not so much interested in the type of road, as they are in its smooth riding characteristics, and that if a state desires to continue the use of the so-called cheaper types, then all they have to do is to use the same care and preparation as for the more expensive surfaces. The cost of good inspection is much less than poor inspection, for the saving is immediately reflected during the subsequent years, in lower maintenance charges, and the satisfaction derived from the excellence of the road.

The same principles apply to the construction of gravel, "retread," or even asphalt treated shales. It pays to take pains with the smallest details. If by following these methods, excellent durable surfaces can be obtained at costs from \$5,000 to \$20,000 per mile, and then maintained thereafter at an annual expense which is less than the difference of interest charges on these types and the expensive pavements, assuredly there will be much approbation from the public because of the much larger mileage from the same expenditure of funds. I repeat: the public does not care what the road is made of, but it does demand (and properly so) that those roads shall be smooth, and safe.

LOWER VISIBILITY

Customer: "I should like to try that frock on in the window."

Assistant: "Sorry, madam, but the management will not allow that. Would you care to try it on in our private fitting room?"—*New Hampshire Highways.*

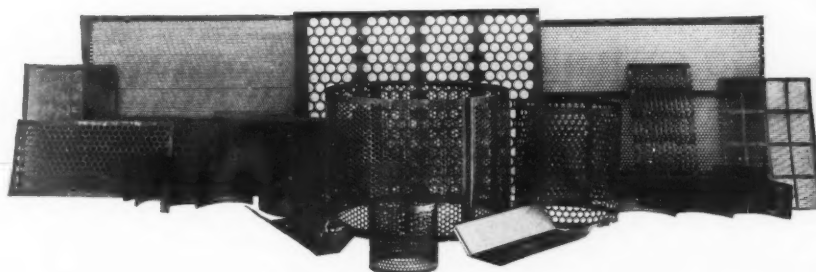
When writing advertisers please mention THE CRUSHED STONE JOURNAL

PERFORATED METAL SCREENS

*The quality of CROSS Screens gives longer service,
increased production and lower cost.*

CATALOG ON REQUEST.

BUCKETS,
TROUGH,
FLIGHTS,
CHUTES,
ETC.

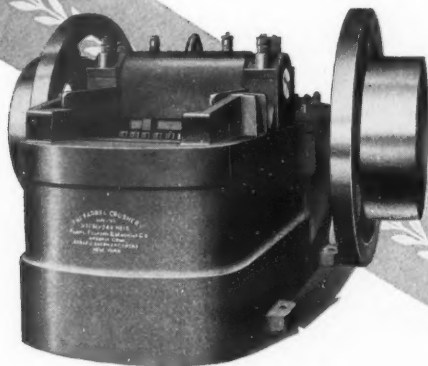


*Rush Orders
often Shipped
within
twenty-four hours*

CROSS ENGINEERING CO.

CARBONDALE, PA.

Farrel Crusher Performance *is reflected by its wearing parts*



FARREL-BACON quality standards are reflected by the wearing parts chosen for the Farrel primary crusher.

Lowest cost per ton is Farrel's aim. So dependable, long-wearing TISCO Manganese Steel is employed for jaw plates, cheek plates and toggle bearings; — the steel that economically meets every wear-part requirement, and that will give the most efficient service in your plant.

TISCO Manganese Steel is standard on more and more heavy duty machines. It is the best evidence that the builder's quality standards are sound — and that the machine will measure up to your requirements.

Far-sighted operators also insist on replacement parts of dependable TISCO, whether for crusher parts, dipper teeth, screen cloth and plate, etc. There are bulletins available covering every requirement. Ask for copies.

TISCO
Manganese Steel

TAYLOR-WHARTON IRON AND STEEL CO.

HIGH BRIDGE, NEW JERSEY

SALES OFFICES:
Philadelphia

Pittsburgh
Boston

Chicago
San Francisco

Houston
Scranton

Montreal
Tampa

New York
Los Angeles

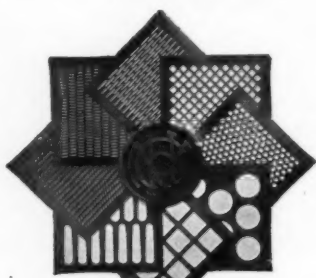
When writing advertisers please mention THE CRUSHED STONE JOURNAL



NOW!

Punched Manganese Plate

11-14% manganese



REG. U. S. TR. MARK

THE inherent advantages of perforated plate screen are now emphasized more strongly than ever through punched manganese plate.

This new Manganese is "punchable." We can supply quarry operators with this very serviceable material in practically any size opening.

Write for particulars

HENDRICK MFG. CO.

39 River St., Carbondale, Pa.

BALTIMORE BIRMINGHAM BOSTON CINCINNATI DETROIT
HAZLETON NEW YORK PHILADELPHIA
CLEVELAND PITTSBURGH

*Makers of Mitco Interlocked Steel Grating, Mitco Shur-Site
Treads, Mitco Armorgrids and Elevator Buckets of all Types*

Louisville Cement Company's Record Exceeds Six Years

The outstanding record in accident prevention so far established for the crushed stone industry is that held by the Speed quarry of the Louisville Cement Company at Speed, Indiana, which up to the middle of this summer had completed six years and three months with no lost-time accidents. J. M. Buchheit, Superintendent of the quarry, in sending in his comments has been exceedingly brief, but we believe very much to the point. He writes as follows:

"I will classify these standards as I see them:

"First, Cooperation of plant executives with foremen and men; Second, Holding foremen responsible for safety work and provide safe working conditions; Third, Compelling men to work safely.

"Foremen and men must cooperate to have success in safety work. Some men seem to lack the faculty of cooperation and never seem to be able to acquire it; such people usually make themselves miserable and everyone else about them, and the result is that they are ultimately compelled to relinquish the positions they hold in favor of other people who are able and willing to cooperate with others in safety work.

"Success in safety work is cooperation and education."

We Invite You to St. Louis

(Continued from page 13)

interest today, is the complete showing of the famous Lindbergh Collection, including gifts, medals, trophies and souvenirs from a score of foreign countries and from thousands of sources. This collection occupies one entire wing of the building. Col. Lindbergh is a loyal St. Louisan and has chosen the Jefferson Memorial, with the Missouri Historical Society as custodian, as the permanent resting place for the mementos which have come to him in connection with the epoch-making flight of the "Spirit of St. Louis" across the Atlantic, and his friendship tour of the countries of Mexico, Central and South America.

How Perfect Records in Accident Prevention Are Accomplished

(Continued from page 10)

it to be one of our strongest safety-spirited locations. However, the future may hold as great an endurance contestant in our organization as this plant; we feel that greater results can be attained by patience and perseverance."

Jones

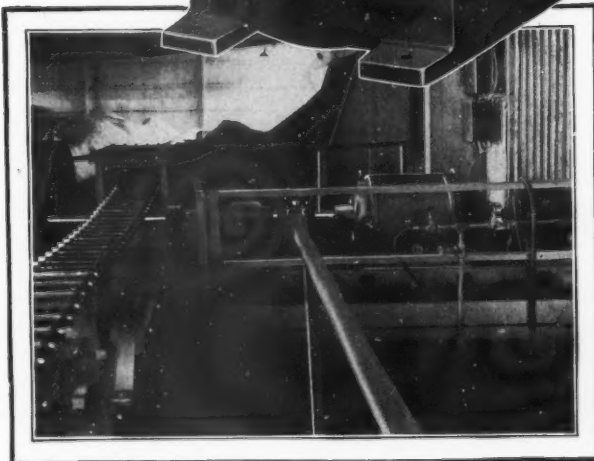
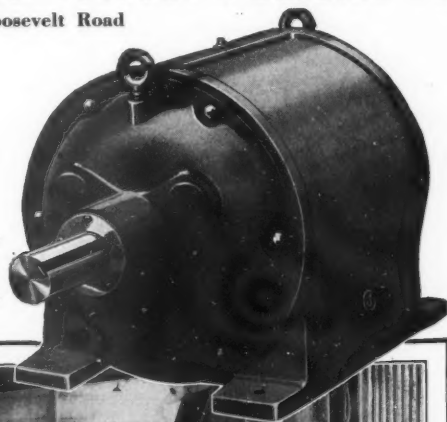
Spur Gear
**SPEED
REDUCERS**

THE savings effected by Jones Spur Gear Speed Reducers start with their installation, which is simple and inexpensive. Greater power efficiency is obtained. Upkeep costs are practically eliminated and infrequent refilling of the oil supply is the only attention required. Depreciation is negligible—the dust-proof housing insuring perfect operating conditions. Space is saved. Accidents are prevented.

Write for catalogue and services of a Jones engineer.

W. A. JONES FOUNDRY & MACHINE CO.
4401-4451 W. Roosevelt Road
Chicago, Ill.

Jones
Spur Gear Speed
Reducer
driving chain
conveyor.
Reduction ratio
27-1.



Your Profits Depend Upon Your Crane



P & H Cranes are built to handle materials cheaply. They are the product of *the largest crane building concern in the world*—a firm that has built more than 12,000 cranes of various sorts.

P & H Cranes have never been sold on the lowest-price basis. Their performance records have proved that they are well worth the price asked for them. That's why some users have purchased as many as 20 P & H's, one after another.

Because of P & H large production, the prices of these cranes are very reasonable, quality considered. If you are thinking about cranes, it will be well worth your while to investigate the P & H. Ask for bulletins.

HARNISCHFEGER CORPORATION

Established in 1884

4425 W. National Avenue, Milwaukee, Wisconsin

Offices and Agents in All Principal Cities

WAREHOUSES AND SERVICE STATIONS

Hoboken, Memphis, Jacksonville, San Francisco, Los Angeles
Seattle, Dallas

P & H

CORDUROY

[CRAWLER] —

CRANES —

TECHNICAL SERVICE IN QUARRY BLASTING



"A PROPER EXPLOSIVE
FOR EVERY
BLASTING
REQUIREMENT"

Quarry Blasting has developed into a science that has attracted the Engineer. Full and complete knowledge of industrial explosives, blasting supplies, rock formations, and of quarry operations are factors which require technically trained men as advisers on how crushed stone can be produced most economically.

To a great extent the cost of stone ready for the crusher is governed by the kind and location of drill holes and the judgment exercised in the choosing and applying explosives. This can be mastered by the layman, but the ever increasing list of explosives and their specific properties as well as the unusual conditions of formation of rock, which are constantly encountered, present problems that require the service of the Engineer.

To aid quarrymen to obtain best results in blasting, the Atlas Powder Company has been as energetic in training men to serve as Engineers or Technicians in the use of explosives as it has been in research work to devise new explosives and blasting supplies. The quality of the products of the Atlas Powder Company has always been unexcelled and the technical service that this company can offer takes equal rank with it.

You may depend upon the statements to describe our products and the recommendations to improve blasting as made by Atlas Technical Representatives as being reliable and conservative.

This service is freely offered and can be secured by requests made to either Branch Offices or to the General Office of this company.

ATLAS

POWDER COMPANY

Wilmington, Delaware

Branch Offices:

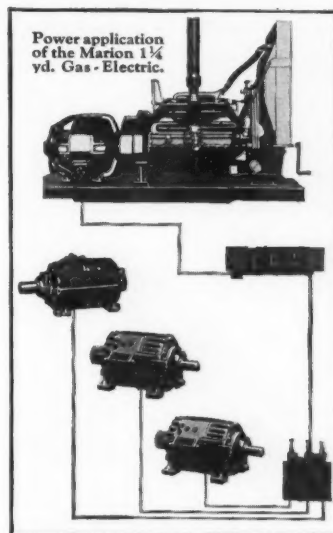
Allentown, Pa.; Boston, Mass.; Chicago, Ill.; Houghton, Mich.; Joplin, Mo.; Kansas City, Mo.; Knoxville, Tenn.; McAlester, Okla.; New Orleans, La.; New York, N.Y.; Norristown, Pa.; Philadelphia, Pa.; Pittsburg, Kansas; Pittsburgh, Pa.; Pottsville, Pa.; St. Louis, Mo.; Wilkes-Barre, Pa.

When writing advertisers please mention THE CRUSHED STONE JOURNAL



No Clutches!

POWER is transmitted through wires instead of clutches on this shovel — power under control of the operator's hand—ready to out-dig and out-live any clutch-type shovel in the field. 50% of hundreds of owners operate two or more of this new-type excavator. Find out for yourself, first-hand, what a 450 Gas-Electric will do for you — get in touch with a Marion man today!



Power application of the Marion 1 1/4 yd. Gas - Electric.

Power transmitted through wires — three independent motors — perfect control — no clutches to work or wear.

Come to Shovel



Headquarters

THE MARION STEAM SHOVEL COMPANY

DISTRICT OFFICES — NEW YORK — CHICAGO — PHILADELPHIA — BIRMINGHAM
KANSAS CITY — SEATTLE — SAN FRANCISCO

MARION, OHIO, U. S. A.

When writing advertisers please mention THE CRUSHED STONE JOURNAL

Are You

READY MIXED
CONCRETE
PLANTS

Agitator
TRUCK
BODIES



BLAW-KNOX

► Ready to Mix or
Ready to Lose?

READY-MIX cement is the latest trouble-maker in the much-troubled builders' supply industry. Having the complete ready-to-pour mixture delivered right on the construction or repair job—almost from truck into forms with one operation—saves time, special labor, often the getting of special permits.

Distributors have been slow to invest in ready-mix equipment with the result that, in many cities, separate supply concerns have sprung up. These buy their cement direct from its manufacturer.

Distributors have lost sales volume, must be content to lose more, or get on the band wagon with a ready-mix plant.

This article appeared in
"THE BUSINESS WEEK"

The editor of "THE BUSINESS WEEK" places his finger on a vital spot.

Blaw-Knox Company saw this "handwriting on the wall" five years ago and since that time has assisted scores of building supply dealers to get into the Ready Mixed Concrete Business on an economical and profitable basis.

Blaw-Knox numbers among its accomplishments the largest and most successful plants in the country.

BLAW-KNOX PLANTS are properly designed for the production of READY MIXED CONCRETE on any scale. Blaw-Knox AGITATOR TRUCK BODIES will haul the wet concrete without segregation and at low cost.

Now is the time to call on the experience of Blaw-Knox for facts and figures on the Ready Mixed Concrete Business.

BLAW-KNOX COMPANY

2053 Farmers Bank Building, Pittsburgh, Pa.

I am interested in the production and hauling of Ready Mixed Concrete—Send me Facts and Figures on the Ready Mixed Concrete Business.

COMPANY _____

INDIVIDUAL _____

CITY _____

STATE _____

When writing advertisers please mention THE CRUSHED STONE JOURNAL



Bring Your Superintendents

Engineers and Operating Men

The Latest in Equipment and Machinery

Helpful and Inspiring Talks

Educational Discussions

Renewed Friendships

Enjoyable and Unique Entertainment

The Fourteenth Annual Convention of the

National Crushed Stone Association

St. Louis, Missouri

January 19, 20, 21 and 22, 1931



CORDEAU Helps Improve the Fragmentation

CORDEAU, by speeding up the rate of detonation of the explosive charges in a blast, adds materially to the shattering effect of the explosive no matter whether it is a high grade dynamite or the slower blasting powders. Rock well broken, toe kicked out, little secondary blasting, and crushing units well supplied with rock mean good operating conditions and consequent profit for the quarry operator.



CORDEAU:
DETONATING FUSE
BICKFORD

THE ENSIGN-BICKFORD CO.

SIMSBURY - CONNECTICUT

When writing advertisers please mention THE CRUSHED STONE JOURNAL